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THE USE OF MANGROVES FOR AQUACULTURE: INDONESIA

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National Agencies Involved

Ministry of Marine Affairs and Fisheries
Ministry of Forestry
Ministry of Environment

OVERVIEW

Mangrove Areas

Indonesia has more than 17,500 islands and 81,000 km of coastline which bears the biggest mangrove area in the world, based on the data given by a source in 1982, which stated that mangrove areas was 4.25 million ha or 27 % of the mangrove areas in the world. Table 1 shows the distribution of mangrove areas in Indonesia.

Table 1. The distribution of mangroves in Indonesia

No	Province	Mangrove Area (Ha) by Different Sources		
		DG of Fisheries (1982)	Sievius et.al (1987)	Giesen (1993)
	SUMATERA			
1	Aceh	54,350	55,000	20,000
2	North Sumatera	60,000	60,000	30,750
3	West Sumatera	0	0	1,800
4	Riau	276,000	470,000	184,400
5	Jambi	65,000	50,000	4,050
6	South Sumatera (incl. Babel)	195,000	110,000	231,025
7	Bengkulu	0	20,000	< 2,000
8	Lampung	17,000	3,000	11,800
	JAVA & BALI			
9	West Java (incl. Banten)	28,608	5,700	< 5,000
10	Central Java	13,577	1,000	13,577
11	East Java	7,750	500	500
12	Bali	1,950	500	< 500
	LASSER SUNDA			
13	West Nusa Tenggara	3,678	0	4,500
14	East Nusa Tenggara	1,830	21,500	20,700
	KALIMANTAN			
15	West Kalimantan	40,000	60,000	40,000
16	Central Kalimantan	10,000	20,000	20,000
17	South Kalimantan	66,650	90,000	66,650
18	East Kalimantan	266,800	750,000	266,800
	SULAWESI			
19	North Sulawesi (incl. Gorontalo)	4,833	10,000	4,833
20	Central Sulawesi	0	0	17,000
21	South Sulawesi	66,000	55,000	34,000
22	Southeast Sulawesi	29,000	25,000	29,000
	MALUKU			
23	Maluku (incl. North Maluku)	100,000	46,000	100,000
	PAPUA			
24	Papua	2,943,000	1,382,000	1,382,000
	TOTAL	4,251,000	3,235,700	2,490,185

The table also indicates that the later data in 1987 and 1993 the total mangrove areas were only 3.23 and 2.49 million ha, respectively, and these have been reportedly reduced by about 1.0 and 0.8 million ha, respectively, allegedly due to aquaculture. Various sources also supply different data, but generally, the tendency of deforestation in mangrove areas is also shown.

Brackishwater pond culture was always suspected to be the main cause of the deforestation. Nevertheless, the development of brackishwater pond area does not support the allegations. From the data given by the Directorate General of Fisheries, brackishwater pond area in 1982, 1987 and 1993 are 220,400 ha, 263,200 and 331,800 ha, respectively, which means only about 22% ha (of the 1.0 million ha reduction) and 41% ha (of the 0.8 million ha reduction) may have caused the mangrove area reduction. In reality, not all of the brackishwater ponds are developed in mangrove areas as some of them are in coastal sand areas.

ROLE AND POTENTIAL OF MANGROVES IN THE NATIONAL ECONOMY

For many decades, mangroves have always been used by the Indonesians as source of their livelihood. In the mangrove ecosystems, vegetation do not only consist of trees and shrubs, but also the unique association of some plants, animals and microorganisms adapted to live in the intertidal belt. The role of mangroves to support the national economy can be listed as follows:

- The wood is used as materials for chips, pulp, paper, tannin, timber, fiber, charcoal etc, as well as for firewood
- Ecosystem of mangrove as living resources is a productive organic producing area and acts as a main food chain in coastal ecosystems
- As recreational resort for angling, boating, and bird hunting
- Coastal protection against abrasion and wind
- Livelihood of coastal community, especially for fishermen and the fish farmers

ROLE OF MANGROVES AS FISHERY RESOURCE

Mangroves give a significant role for fish and fisheries, as stated by the Asian Wetland Bureau, mangroves is needed by 80% of fish species consumed by the Indonesian people. Thus the role of mangroves include among others, the following:

- Protection of fish habitat in coastal area against abrasion and strong wind
- Exporting agent for organic materials to surrounding coastal ecosystems, as a main support for coastal fisheries
- Nursery ground, feeding ground, spawning ground, and shelter area for juvenile and adult fish and shrimp
- Bio-ecologically as a growing habitat for young fish and shrimp
- Therefore, the most available area to be converted as brackishwater ponds

PROTECTION AND DEVELOPMENT OF MANGROVE AREAS

Historical Data

Degradation of mangroves is apparent in several coastal areas in Indonesia, mainly because of irresponsible mangrove cutting for various utilizations. Mangroves were converted to various development activities such as agriculture area development, brackishwater aquaculture ponds, pier construction, and others.

Reasons for the Decreasing Mangrove Areas

The reasons for the degradation of mangroves, which lead to their unsustainability are:

1. Multiple utilization among different sectors and over utilization of resources have caused coastal abrasion
2. Occurrence of new land as a result of a long siltation process, which may cause conflict of ownership and/or land status
3. Conversion of mangroves to residential area, brackishwater ponds, industrial village, salt ponds, and others
4. Rapid development of coastal population which leads to the increase of its living requirements
5. Insufficient institutional and legal framework, such as the rights conflict between central and local government
6. Lack of information on coastal ecosystems, variability of resources, etc.
7. Very low understanding and also consideration of coastal people about the function of mangroves

LAWS, RULES, REGULATIONS AND POLICIES ON MANGROVES

Historical Overview

Act No. 5/1990 on Conservation of Living Natural Resources and its Ecosystems stated that the utilization of the living resources and its ecosystems is done, among others through the utilization of mangrove forest and its environment. Presidential Decree No 32/1990 regulates the utilization of conservational forest, especially mangrove forest area.

Existing Legal Framework

Fishery Laws with Relevance to Mangroves

Recognizing the importance of mangrove ecosystems, legal frameworks have been produced in relation to regulate the responsible utilization of mangrove. The regulations are shown in Table 2.

Environment Laws with Relevance to Mangroves

Environmental regulations with relevance to mangroves could also be seen in Table 2.

Policy Options

Policy to be taken for the sustainable use of mangrove should accommodate the participation of coastal communities. It should therefore consist of:

1. Developing the public awareness on the role of mangroves on environment and aquaculture
2. Accommodating self re-plantation of mangroves by coastal community
3. Disseminating environment-friendly aquaculture technology, consisting of demonstration, training, information, etc.

Table 2. Regulations related to mangroves utilization in Indonesia

No	Regulation	Short Description
1	Act No. 4/1982 on Main Rules of Environmental Management	Conservation of living and non-living natural resources including its ecosystems, artificial resources, and of natural preservation
2	Act No. 5/1990 on Conservation of Living Resources and its Ecosystems	Conservation on buffer zone, diversity of flora and fauna and the ecosystems, natural reservation area, sustainable management of living natural resources and its ecosystems (mangroves included)
3	Act No. 24/1992 on Spatial Planning	This Act is a basis of the Government to plan the utilization of land, marine areas and aerial space
4	Government Regulation No. 51/1993 on Environmental Impact Analysis	Regulation on environmental impact analysis, environmental management and environmental control for any type of industry which may have impact on its environment
5	Government Regulation No. 28/1985 on Forest Conservation	
6	Presidential Decree No 32/1990 on Management of Conservation Area	Basic policy, establishment and control of conservation areas (including mangroves as greenbelt))
7	Agriculture Ministerial Decree No. 837/Kpts/Um/11/1980 on Criteria and Mechanism of Establishment of Conservation Forest	
8	Joint Agriculture and Forestry Ministerial Decree No. 550/246/Kpts.14 1984 on Assignment of Forest Area for Agriculture	Production forest can not be used for development of agriculture, and arrangement of mangrove area for the development of aquaculture, which establishing 200 meters of mangroves as greenbelt
9	Agriculture Ministerial Instruction No.13/Ins/Um/7/1975 on Management of Mangroves	Regulates the responsible management and utilization of mangroves
10	Agriculture Ministerial Decree No. 752/Kpts/OT.210/10/94 on Technical Guidelines for the Effort of Environmental Management and Environmental Monitoring of the Agriculture Activities and Business	Based on this decree, a farm cultivating shrimps on pond area of 5 ha to 50 ha adopting intensive or semi-intensive production intensities with a processing unit should have environmental management and environmental monitoring plans.
11	Agriculture Ministerial Decree No. 25/Kpts/OT.210/1/95 on the Technical Guidelines for the Environment Impacts Analysis of the Agriculture Activities and Business	Shrimp culture conducted on a farm of 50 ha or more should assess its impacts on its environment
12	DG of Forestry Decree No. 60/Kpts/DJ/ 1978 on Guidance for Brackishwater Silvofishery Systems DG of	A guideline for the development of silvofishery
13	Fisheries Instruction No. HI/4/2/18/75 on Establishment of Greenbelt of 400 Wide from Coastline	Instruction on the establishment of green belt within a wide of 400 m from the lowest tidal along the coastal zone

PROGRAM ON THE RESPONSIBLE USE OF MANGROVES FOR AQUACULTURE IN INDONESIA

A program on the responsible use of mangroves for aquaculture was established in 1994 to:

- (a) develop community awareness on the implementation of environmental friendly aquaculture, and
- (b) develop the aquaculture system with consideration on the sustainability of conservation area including mangrove ecosystems as a greenbelt.

In 2003, this program involves 12 provinces and 18 districts in the country.

The field activities of the program consist of:

1. Empowering farmer group models

This activity establishes the farmers group that will be cooperating in the implementation of environment-friendly aquaculture.

2. Development of brackishwater aquaculture post harvest facilities

This is to provide handling space and develop a strong cooperation among the members of the groups.

3. Rehabilitation of irrigation canals

This is to increase the pond productivity of the group members.

4. Mangrove plantation (reforestation)

The mangrove plantation is done to improve the environmental quality, and at the same time to build the awareness among group members and surrounding communities.

5. Development of mangrove crab and/or *Anadara* reservation area

The reservation area is developed for the sustainability of the species population of mangrove crab and the mollusk *Anadara* spp, as natural hatchery for the development of the species aquaculture.

6. Demonstration of environmental friendly aquaculture/silvofishery

This activity aims to demonstrate and motivate the farmers to adopt the technology.

7. Technology development and group empowerment

This activity is aimed at enhancing the technical capability of the farmers as well as strengthening the collaboration among themselves.